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IS 14540 (1998): Intercultivation Equipment - Hand hoes
[FAD 21: Farm Implements and Machinery]

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भारतीय मानक

अंतःकृषि उपस्कर – हस्तचालित कुदाल – विशिष्टि

Indian Standard

INTERCULTIVATION EQUIPMENT — HAND HOES — SPECIFICATION

ICS 65.060.20

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

May 1998

Price Group 7

Farm Implements and Machinery Sectional Committee, FAD 59

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Farm Implements and Machinery Sectional Committee had been approved by the Food and Agriculture Division Council.

Intercultivation is a process of soil cultivation performed in standing crop. A large number of hand hoes are used as intercultivation equipment. Earlier the requirements of various types of hand hoes were covered in IS 3185 : 1965 " 'V' blade hand hoe", IS 3292 : 1965 'Three tined hand hoe, fixed type', IS 3467 : 1966 'Wheel hand hoe', IS 8179 : 1976 'Garden dutch hoe', IS 12617 : 1989 'Hand cultivator' and IS 13817 : 1993 'Dryland weeders, manually operated'. At the time of review of these standards the committee decided to merge all these standards into one to make it more comprehensive and user's friendly. With the publication of this standard these standards will be withdrawn.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

INTERCULTIVATION EQUIPMENT — HAND HOES — SPECIFICATION

1 SCOPE

This standard prescribes the requirements of various types of hand hoes used for intercultivation.

2 REFERENCES

The Indian Standards listed in Annex A contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated.

3 TYPES

For the purpose of this standard the hand hoes are of following types:

Type 1 — V-blade hand hoe (*see* Fig. 1)

Type 2 — Three-tined hand hoe, fixed type (*see* Fig. 2 and 3)

Type 3 — Wheel hand hoe (*see* Fig. 4 and 5)

Type 4 — Garden dutch hoe (*see* Fig. 6)

Type 5 — Hand cultivator (*see* Fig. 7 and 8)

Type 6 — Dry land weeder

— Peg type (*see* Fig. 9)

— Star type (*see* Fig. 10 and 11)

4 SPECIFIC REQUIREMENTS

Specific requirements of each type of hand hoes are given in Annexes B to G.

5 WORKMANSHIP AND FINISH

5.1 The welding, wherever done shall be satisfactory in all respects. The weld shall be well dressed, smoothly finished and free from porosity.

5.2 Hoe shall be free from cracks, dents and other similar defects.

5.3 The exposed metallic parts shall be suitably painted.

5.4 The axle and bearings in case of wheel hand hoe and dry land weeder shall be cooled with rust proof grease prior to assembly.

5.5 Handle or grip made of wood shall be given a coat of varnish.

6 MARKING

6.1 Each hand hoe shall be marked with:

a) manufacturer's name or his recognized trade-mark,

b) year of manufacture,

c) batch or code number, and

d) size.

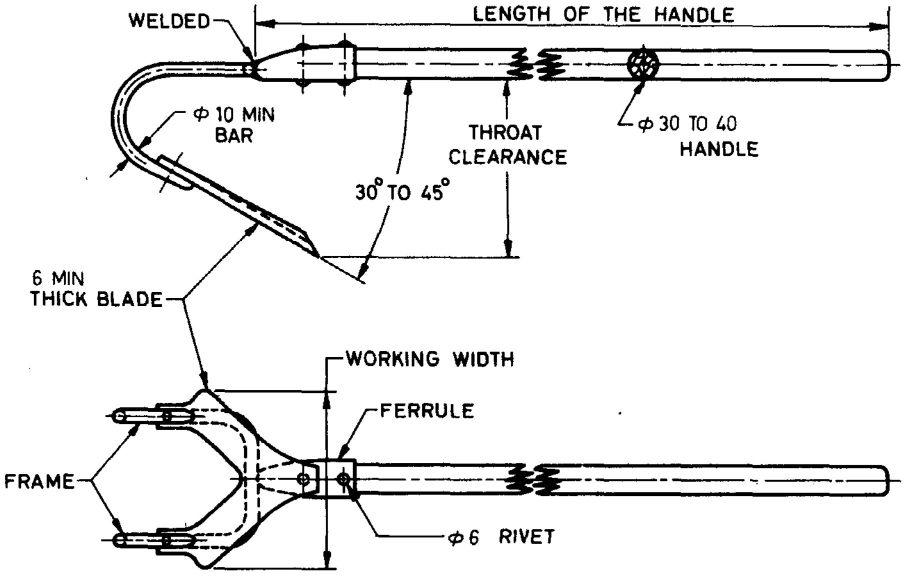
6.2 BIS Certification Marking

Each hand hoe may also be marked with the Standard Mark.

6.2.1 The use of the Standard mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufactuers or producers may be obtained from the Bureau of Indian Standards.

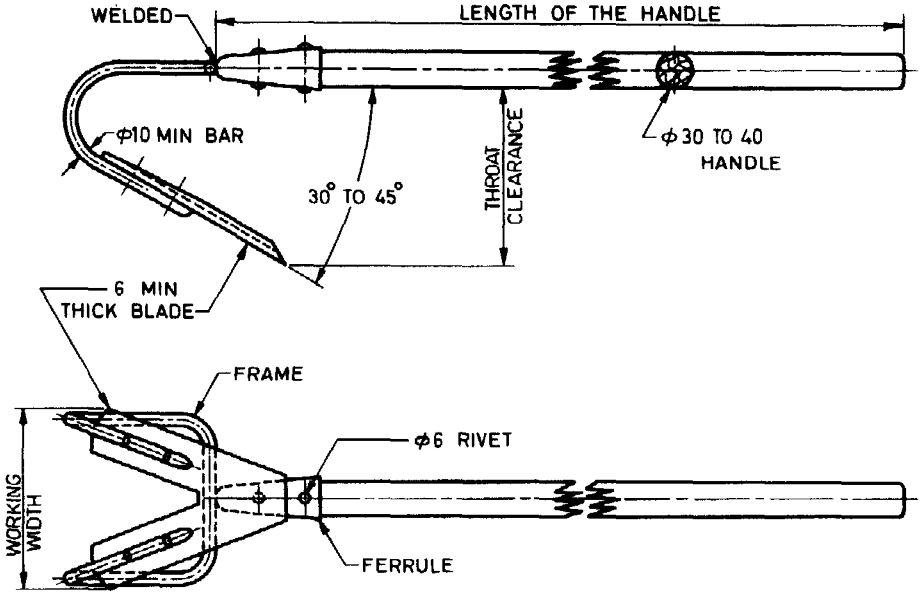
7 SAMPLING FOR LOT ACCEPTANCE

Unless otherwise agreed to between the purchaser and the supplier, the sampling of hoes for lot acceptance shall be done in accordance with 3 of IS 7201 (Part 1).



BOTTOM PLAN

1A



BOTTOM PLAN

1B

Fig. 1 V-Blade Hand Hoe

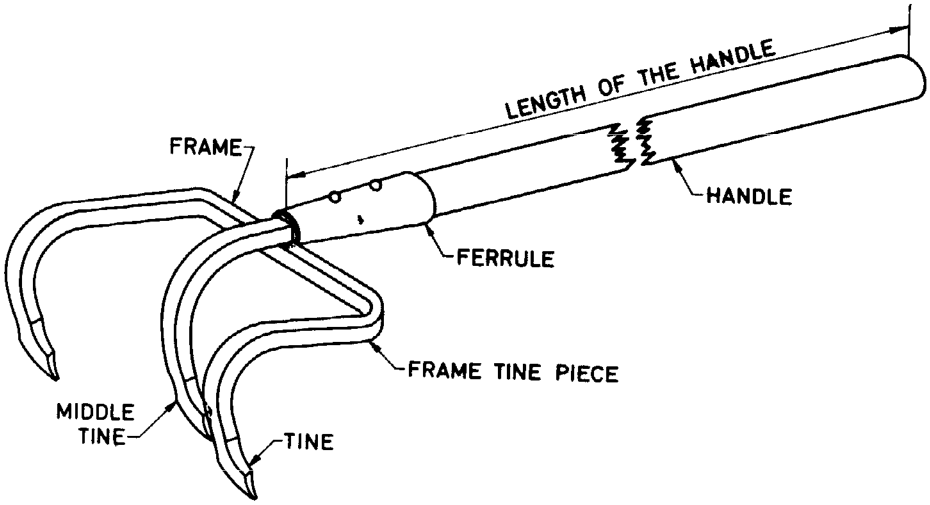
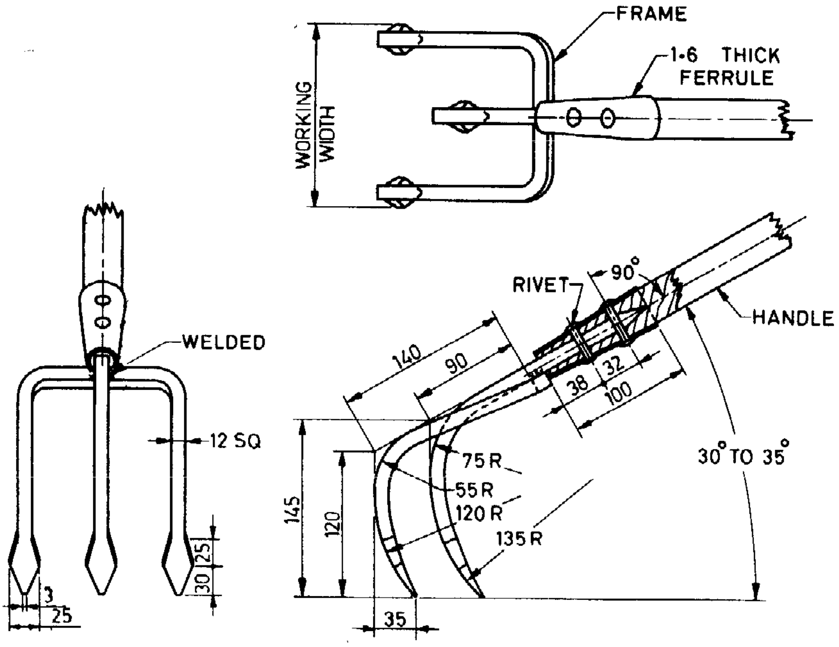
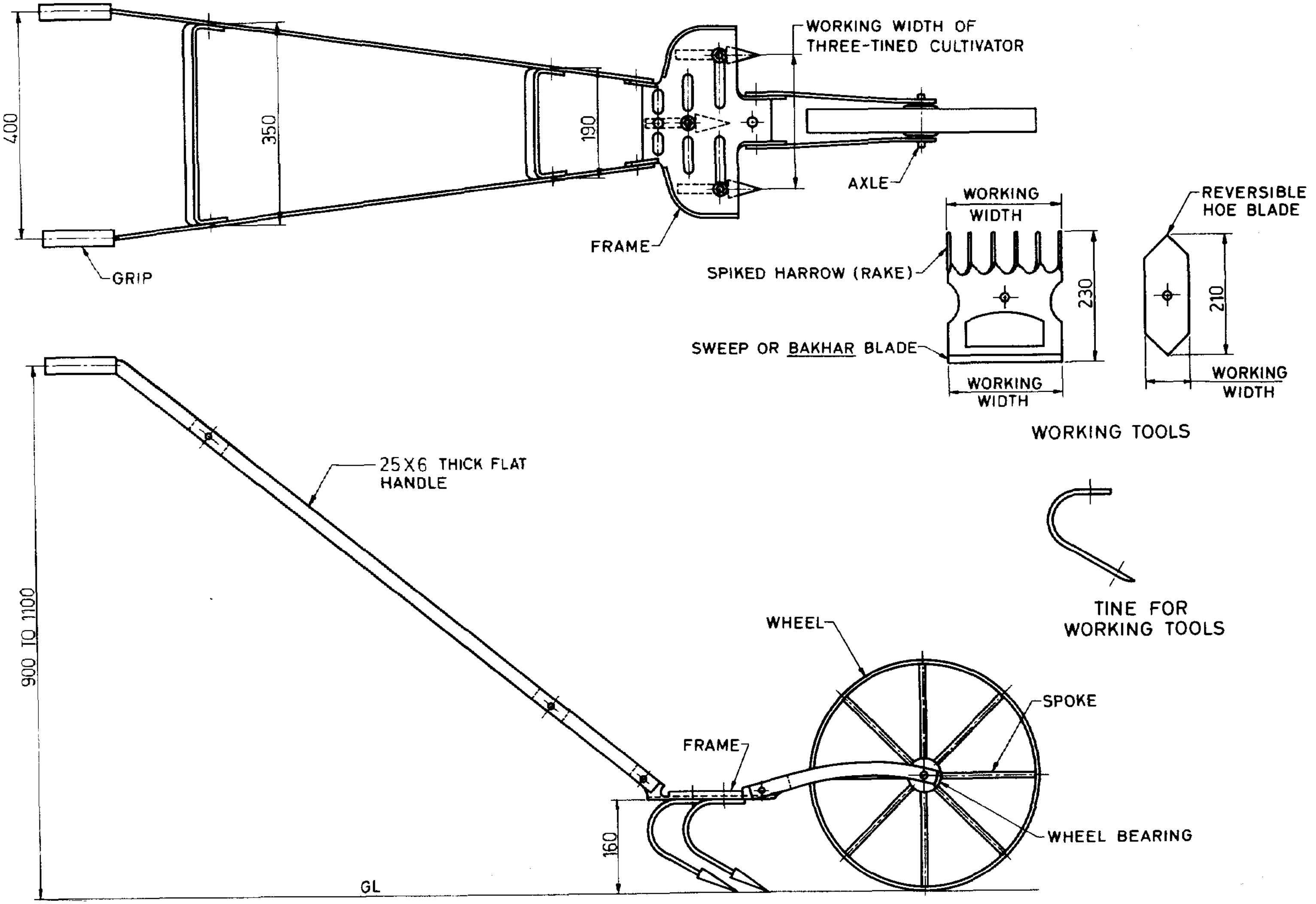


FIG. 2 THREE-TINED HAND HOE, FIXED TYPE



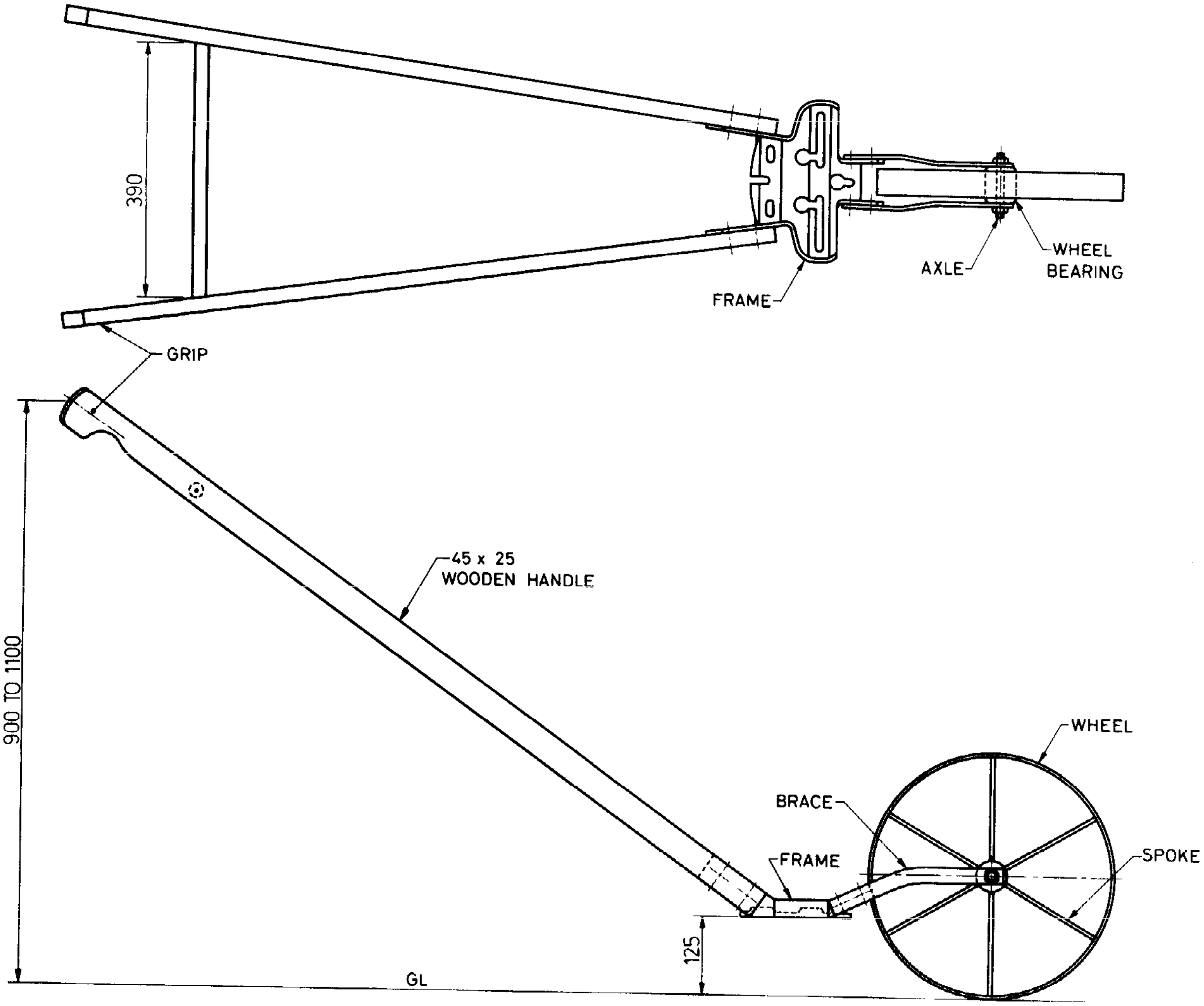
All dimensions in millimetres.

FIG. 3 DETAIL DIMENSIONS OF THREE-TINED HAND HOE, FIXED TYPE



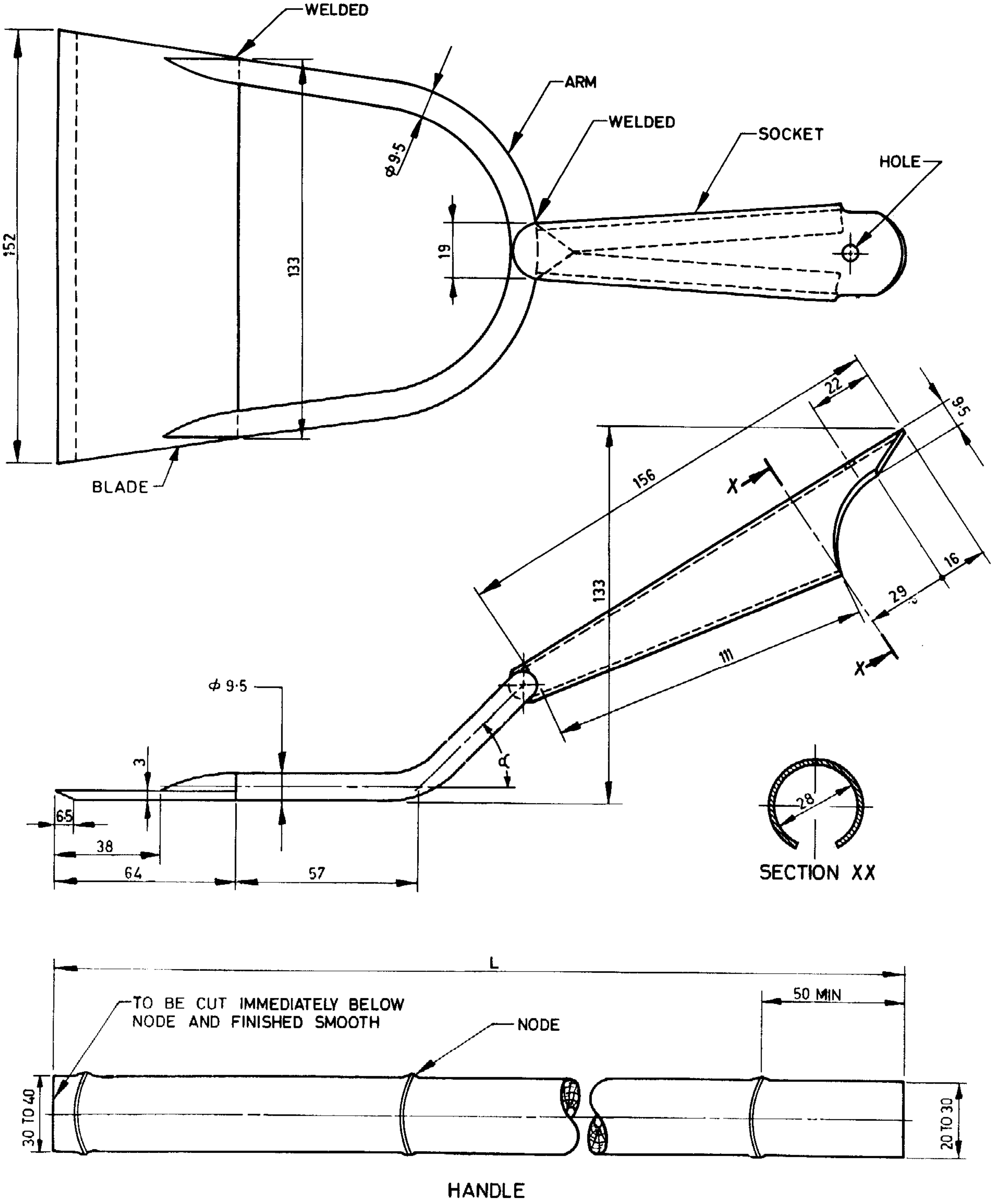
All dimensions in millimetres.

FIG. 4 A TYPICAL WHEEL HAND HOE WITH DIFFERENT TYPES OF WORKING TOOLS (THREE-TINED CULTIVATOR IS SHOWN ATTACHED)



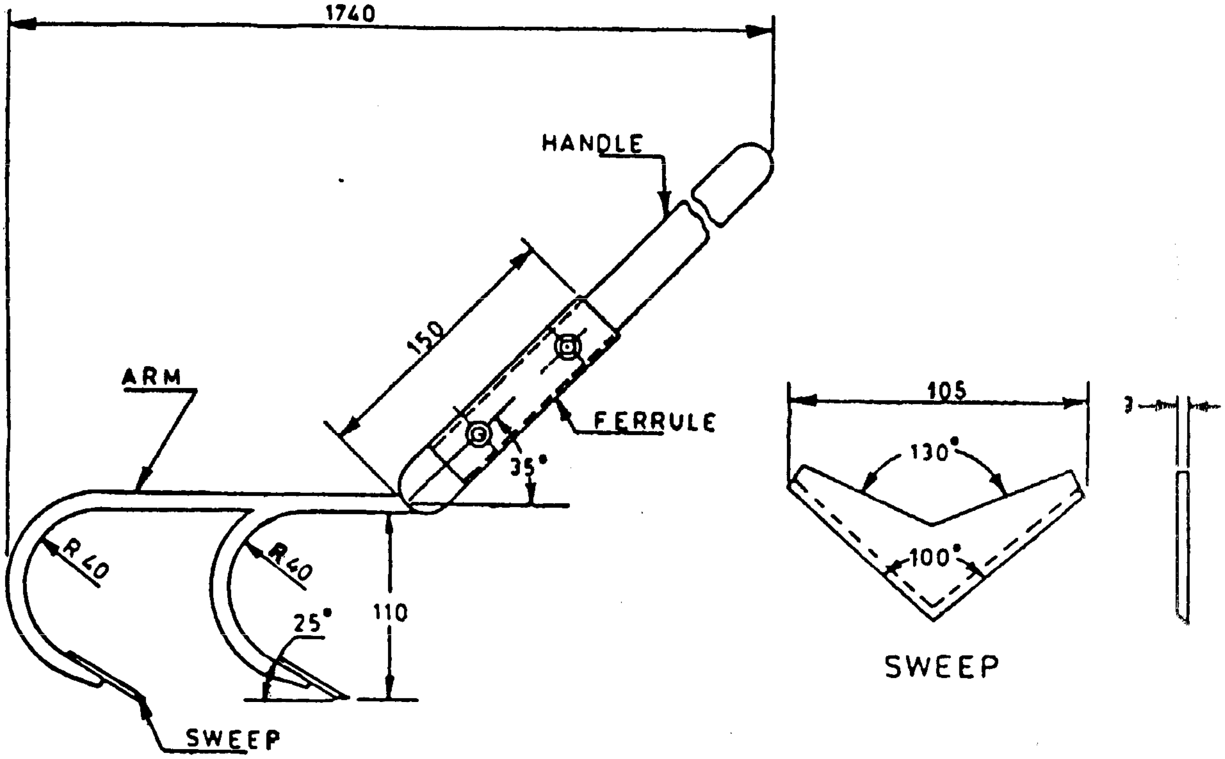
All dimensions in millimetres.

Fig. 5 A Typical Wheel Hand Hoe



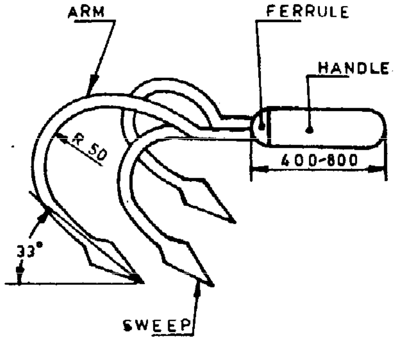
All dimensions in millimetres.

FIG. 6 DIMENSIONS OF GARDEN DUTCH HOE



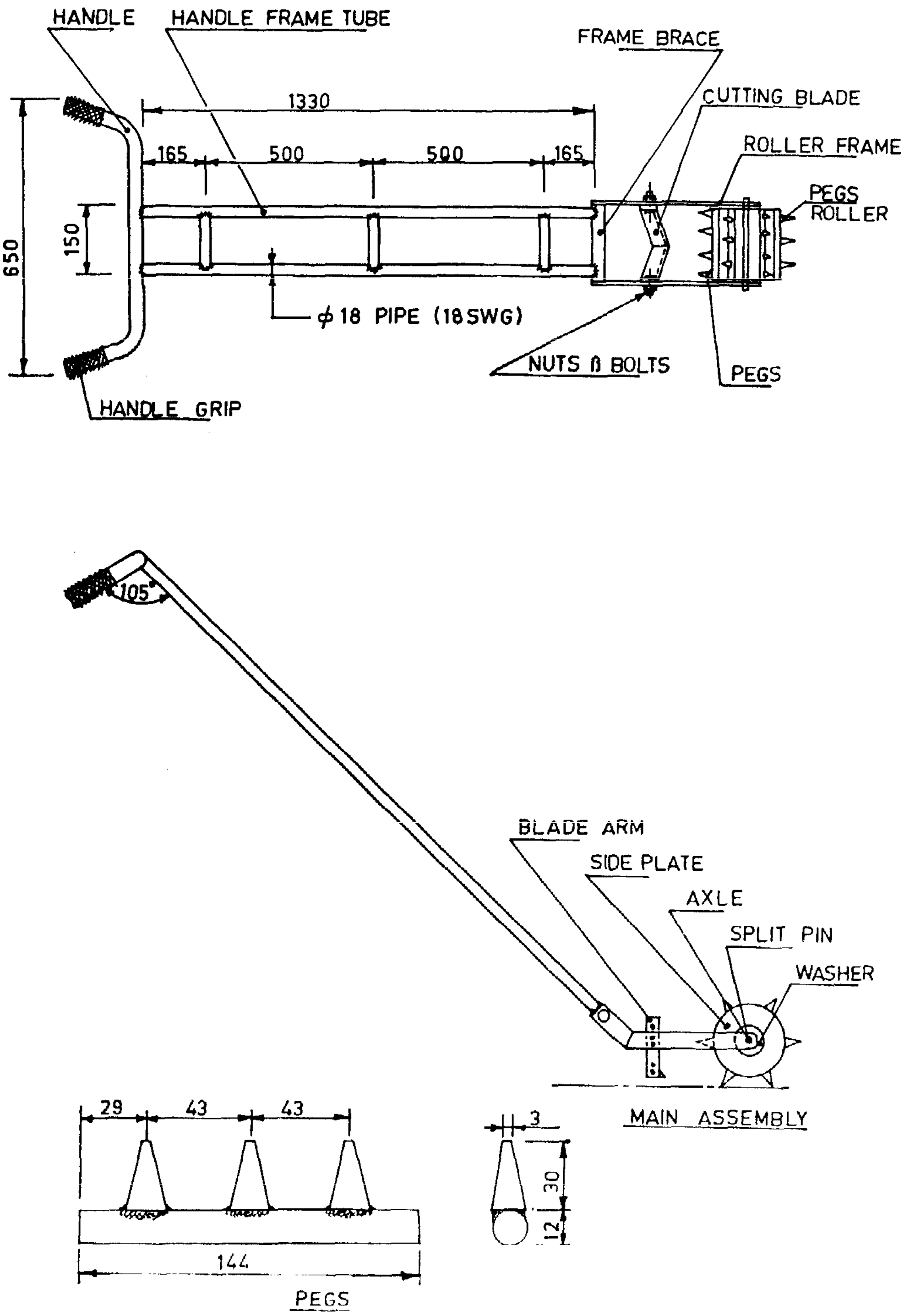
All dimensions in millimetres.

FIG. 7 LONG HANDLE CULTIVATOR



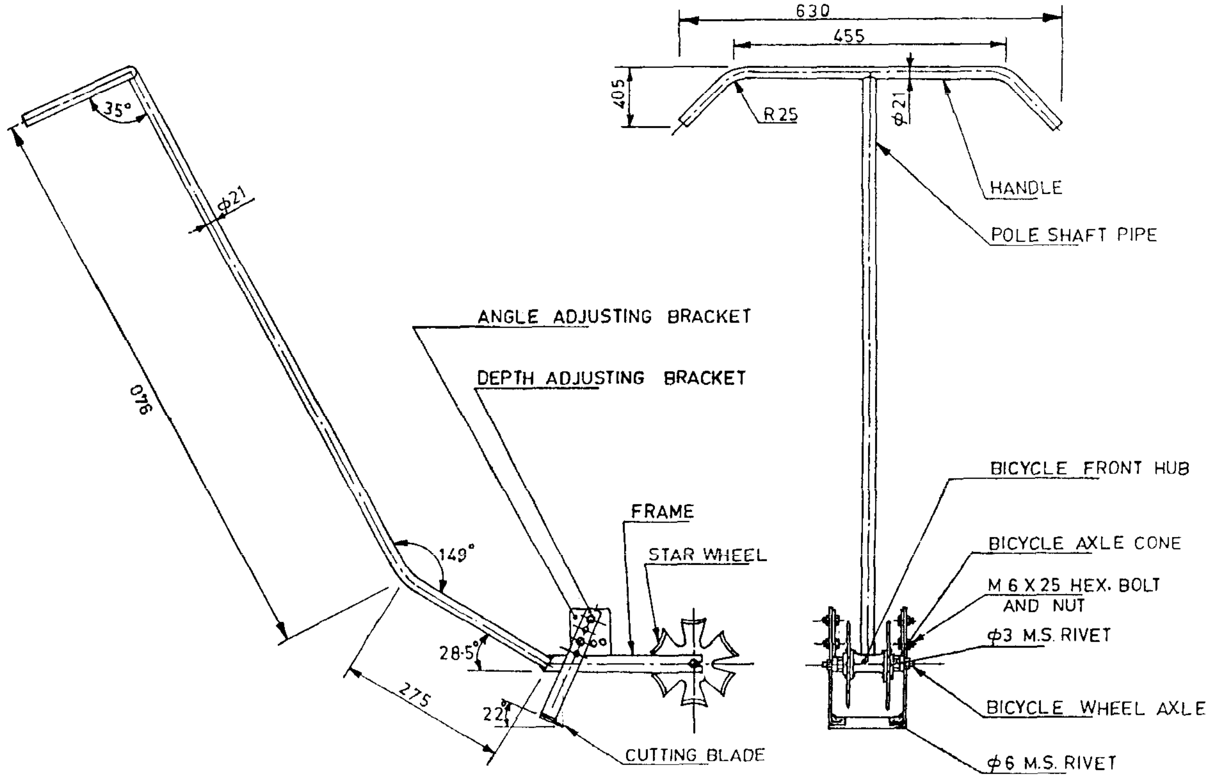
All dimensions in millimetres.

FIG. 8 SHORT HANDLE CULTIVATOR



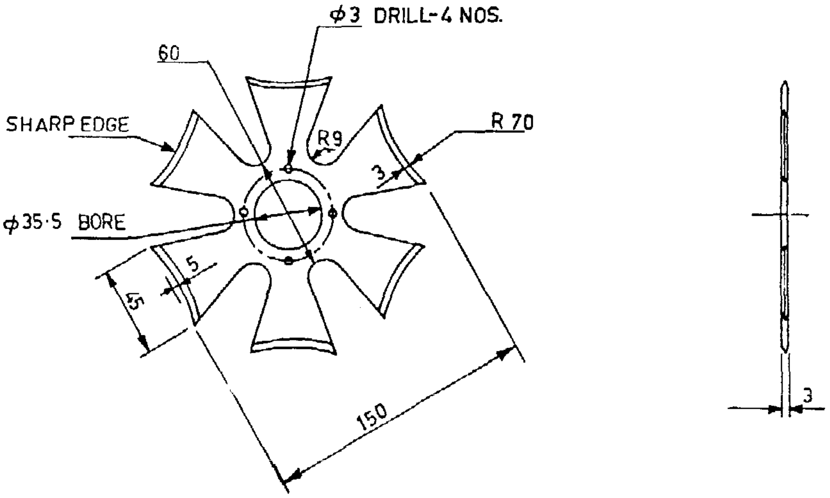
All dimensions in millimetres.

FIG. 9 PEG TYPE DRY LAND WEEDER MAIN ASSEMBLY



All dimensions in millimetres.

FIG. 10 STAR WHEEL TYPE DRY LAND WEEDER MAIN ASSEMBLY



All dimensions in millimetres.

FIG. 11 STAR WHEEL

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
210 : 1993	Grey iron castings (*fourth revision*)
399 : 1963	Classification of commercial timbers and their zonal distribution (*revised*)
620 : 1985	Wooden tool handles general requirements (*fourth revision*)
1500 : 1983	Method for Brinell hardness test for metallic materials (*second revision*)
1501 (Part 1) : 1984	Method for Vickers hardness test for metallic materials : Part 1 HV 5 to HV 100) (*second revision*)
1570 : 1961	Schedules for wrought steels for general engineering purposes
1570 (Part 2/Sec 1) : 1979	Schedules for wrought steels: Part 2 Carbon steels (unalloyed steels), Section 1 Wrought products (other than wire) with specified chemical composition and related properties (*first revision*)
1586 : 1988	Method for rockwell hardness test for metallic material (scale A-B-C-D-E-F-G-H-K) (*second revision*)
2004 : 1991	Carbon steel forgings for general engineering purposes (*third revision*)
2062 : 1992	Steel for general structural purposes (*fourth revision*)
2102 (Part 1) : 1993	General tolerances : Part 1 Tolerance for linear and angular dimensions without individual tolerance indications (*third revision*)
3601 : 1984	Steel tubes for mechanical and general engineering purposes (*first revision*)
4367 : 1991	Alloy steel forgings for general industrial use (*first revision*)
7201 (Part 1) : 1987	Method of sampling for agricultural machinery and equipment : Part 1 Hand tools and hand operated / animal-drawn equipment (*first revision*)

ANNEX B

(*Clause* 4)

SPECIFIC REQUIREMENTS OF V-BLADE HAND HOE

B-1 SIZE

The size of the hand hoe shall be determined by its overall working width (*see* Fig. 1). The working width of the hand hoe shall be between 150 mm and 225 mm.

B-2 SHAPE AND DIMENSIONS

B-2.1 Shape

The shapes of the various parts of two typical hand hoes are shown in Fig. 1

B-2.2 Dimensions

The dimensions of the various parts of two typical hand hoes (*see* Fig. 1), other than those specified in the text, are with reference to particular types and are for guidance only.

B-3 MASS

The mass of the hand hoe with the handle shall be between 1.5 kg and 2.0 kg.

B-4 ASSEMBLY AND MATERIALS

B-4.1 The hand hoe shall have three parts, namely, the blade, the frame and the handle (*see* Fig. 1).

B-4.1.1 *Blade*

The blade shall be made 'V' shaped and the two arms of the blade shall be either welded or securely riveted to the two ends of the frame (*see* Fig. 1 and **B-4.1.2**). The material for the manufacture of the blade shall be high carbon steel plate of at least 6.0 mm in thickness and with carbon content between 0.5 percent and 0.6 percent (*see* grade C 55 of IS 1570). The curvature of the blade and the way of its fixture to the frame between the plane of the blade and the handle shall be between 30° and 45° (*see* Fig. 1). The throat clearance shall be between 150 mm and 200 mm.

B-4.1.2 *Frame*

The frame shall be fabricated from mild steel bar not less than 10.0 mm (*see* IS 2062) in diameter. The frame may be extended to form the ferrule. If the ferrule forms a separate piece, it shall be welded to the frame (*see* Fig. 1).

B-4.1.3 *Handle*

The handle shall be preferably of solid bamboo or of any suitable hardwood (*see* IS 399). The handle shall comply with the requirements specified for Class IV handles in IS 620. The length and the diameter of the handle shall be in the range of 1 400 to 1 600 mm and 30 to 40 mm respectively. The handle shall be fixed to the ferrule with the help of two rivet bolts of 6 mm size. The handle shall be made smooth and shall not be loose.

ANNEX C

(*Clause* 4)

SPECIFIC REQUIREMENTS FOR THREE-TINED HAND HOE, FIXED TYPE

C-1 SIZE

The size of the hand hoe shall be determined by its width measuring the distance between the outermost cutting edges. The size of the hand hoe shall be between 150 mm and 200 mm.

C-2 SHAPE AND DIMENSIONS

C-2.1 Shape

The shape of the various parts of the typical hand hoe is shown in Fig. 2 and 3.

C-2.2 Dimensions

The dimensions of the various parts of the hand hoe (*see* Fig. 3), other than those specified in the text, are with reference to a particular type of the hand hoe and are for guidance only.

C-3 MASS

C-3.1 The mass of the hand hoe with the handle shall be in the range of 1.5 to 2.5 kg.

C-4 ASSEMBLY AND MATERIALS

C-4.1 The hand hoe shall have two parts, namely, the frame tine piece and the handle (*see* Fig. 2).

C-4.1.1 *Frame Tine Piece*

The frame tine piece shall be of mild steel with carbon content between 0.15 percent to 0.25 percent (*see* 2 of IS 2004). The dimensions of the material used shall be at least 12 mm × 12 mm. The middle portion of the piece shall be the frame and extensions of the piece from the ends of the frame shall be the tines (*see* Fig. 2). The ends of the tines shall be spear-shaped to suit the purpose of interculture. The middle tine shall form as a separate piece and this shall be inserted into the ferrule and welded to the frame. This shall be staggered towards the direction of the handle in such a way that when all the tips of the tines rest on the ground in the working position, the angle formed between the tines and the handle shall be in the range of 30° to 35° (*see* Fig. 3). The ferrule shall be single piece.

C-4.1.2 *Handle*

The handle shall be of bamboo or of any other suitable timber and shall comply with the requirements for Class IV handles in IS 620. The handle shall be fixed to the ferrule with the help of two rivets of 6 mm size each and staggered at 90°. The length and the diameter of the handle shall be in the range of 1 400 to 1 600 mm and 30 to 40 mm.

ANNEX D

(*Clause* 4)

SPECIFIC REQUIREMENTS FOR WHEEL HAND HOE

D-1 MATERIAL

The requirements of the materials used in the manufacture of the various parts of the hoe shall be as given in Table 1.

D-2 SHAPE AND DIMENSIONS

D-2.1 Shape

The shapes of the various parts of typical wheel hoes are shown in Fig. 4 and 5.

D-2.2 Dimensions

The dimensions of the various parts other than those specified in the text are with reference to particular types of wheel hoes (*see* Fig. 4 and 5) and are for guidance only.

Table 1 Requirements of Materials Used for Various Parts of Wheel Hand Hoe

(*Clause* D-1)

Sl No.	Name of the Part	Material	Applicable Indian Standard	Grade
(1)	(2)	(3)	(4)	(5)
i)	Wheel	Cast iron Mild steel	IS 210 IS 2062	150 —
ii)	Handle	Mild steel Wood	IS 2062 IS 399	— —
iii)	Frame	Cast iron Mild steel	IS 210 IS 2062	150 —
iv)	Working tools	Carbon steel	IS 1570	C 55
v)	Wheel bearings	Cast iron	IS 210	150
vi)	Axle	Mild steel	IS 2062	—

D-3 MASS

The mass of the wheel hand hoe shall be in the range of 12 to 14 kg.

D-4 ASSEMBLY

D-4.1 Wheel

It shall be fabricated from mild steel flat (having the width and thickness ranging from 35 to 40 mm and 3.0 to 4.0 mm, respectively) or from cast iron. The wheel hub shall be provided with a cast iron bush bearing fitted on either side of the wheel axle. The diameter of the wheel shall be in the range of 300 mm and 600 mm. The spokes of the wheel shall be at least eight in number and the diameter of each spoke shall be in the range of 6 mm and 10 mm.

D-4.2 Handles

The handle may be made of wood or mild steel (flat or pipe). It shall be adjustable and shall be attached to the axle and frame. If the handles are made of mild steel flat, then the dimensions of the flat used shall be at least 25 mm × 6 mm. The height of the handle grip of the wheel hoe shall be in the range of 900 mm and 1100 mm from the ground level. The diameter of the grip shall be in the range of 30 mm and 40 mm and the length shall be not less than 125 mm.

D-4.3 Frame

The frame shall either consist of a single rigid piece made of cast iron, or it shall be a mild steel structure comprising one or more mild steel flats. In case mild steel flats are used for fabrication of the frame, the minimum width and the thickness of each mild steel flat used shall be 25 mm to 35 mm and 3 mm to 6 mm, respectively. One end of the frame shall be rigidly connected to the working tool (*see* **19.4**) and the other two ends of the frame shall be braced rigidly to the wheel axle.

D-4.4 Working Tools

The working tool may be the spiked harrow, or the blade of reversible type, or the sweep or the BAKHAR blade, or three-tined cultivator or hiller. The dimensions of the various working tools shall be as given in Table 2.

D-5 HARDNESS

The edge of the working tools shall be hardened and tempered to get a Brinell Hardness within the range of 350 to 450 HB (*see* IS 1500).

Table 2 Working Width of the Various Working Tools of Wheel Hoe

(*Clause* D-4.4)

Sl No.	Name of the Working Tool	Range in the Working Width (mm)
(1)	(2)	(3)
i)	Spiked harrow (rake)	200 to 300
ii)	Reversible hoe blade	75 " 100
iii)	Sweep or the BAKHAR blade	200 " 300
iv)	Three-tined cultivator	150 " 250
v)	Hiller	75 " 100

ANNEX E

(*Clause* 4)

SPECIFIC REQUIREMENTS OF GARDEN DUTCH HOE

E-1 MATERIAL

E-1.1 Blade

The blade shall be manufactured from carbon steel sheet with minimum carbon content of 0.45 percent. The material should preferably conform to grade C 50 or any superior grade given in IS 1570.

E-1.2 Arm

Mild steel bar (*see* IS 2062) shall be used.

E-1.3 Socket

Mild steel sheet (*see* IS 2062) of not less than 1.5 mm thickness shall be used.

E-1.4 Handle

Matured, sound, reasonably straight and adequately seasoned bamboo or hard wood (*see* IS 399) shall be used.

E-2 HARDNESS

The blade when tested up to a width of 25 mm from the cutting edge, in accordance with IS 1501or IS 1586 shall have hardness of 450 HV to 550 HV or 43 HRC to 54 HRC, respectively.

E-3 SHAPE AND DIMENSIONS

E-3.1 The shape of a typical garden dutch hoe is given in Fig. 6.

E-3.2 The dimensions of the hoe shall be as given in Fig. 6.

E-3.2.1 The inter-nodal distance of the bamboo, if used in the handle shall not exceed 380 mm. The diameter of bamboo at its thin and thick ends shall be 20 to 30 mm and 30 to 40 mm, respectively.

E-3.2.2 The length of the handle (*see* *L* in Fig. 6) shall be 1.4 to 1.6 m.

E-3.3 The angle of bend of the arm with the horizontal (*see* α in Fig. 6) shall be 45° to 50°.

E-3.4 The tolerances applicable to the dimensions shall be of extra coarse type as given in IS 2102 (Part 1).

E-4 CONSTRUCTION

E-4.1 The arms and the blade shall be forged soundly. The blade shall be properly hardened and tempered and its cutting edge shall be properly sharpened. The arms shall be tapered to point accurately.

E-4.2 The blade shall be welded soundly to the arms.

E-4.3 The socket shall be pressed to the shape and welded firmy to the arm at correct position.

E-4.4 The handle shall be riveted firmly to the socket.

ANNEX F

(*Clause* 4)

SPECIFIC REQUIREMENTS OF HAND CULTIVATOR

F-1 MATERIAL

F-1.1 Sweep

It shall be manufactured from carbon steel grade 55C4, 55C6, 55C8, 60C4, 70C4, 70C6, 75C6 and 80C6 conforming to IS 1570 (Part 2/Sec 1) : or alloy steel conforming to grade 16Ni8Cr6Mo2, 36Si7 or 37C15 of IS 4367.

F-1.2 Handle

Timber (*see* Appendix D of IS 620) shall be used.

F-1.3 Arm

Mild steel (*see* IS 2062) shall be used.

F-1.4 Ferrule

Mild steel pipe shall be used.

F-2 HARDNESS

The sweeps shall have a hardness of 370 HB to 470 HB (*see* IS 1500).

F-3 DIMENSIONS

The dimensions of the long handled and short handled hand cultivators shall be as given in Fig. 7 and 8, respectively. The tolerance for various dimensions shall be as given in IS 2102 (Part 1). The diameter of the handle shall be 20 to 35 mm.

ANNEX G

(*Clause* 4)

SPECIFIC REQUIREMENTS OF DRYLAND WEEDERS, MANUALLY OPERATED

G-1 MATERIALS

The materials for the manufacture of different components of the weeder shall be as given in col 3 of Table 3 and shall, as far as possible, conform to the Indian Standard and the grade of the materials given in col 4 and 5 of Table 3.

G-2 SIZE

G-2.1 The dryland weeder, shall have nominal width of 125 mm, 150 mm or 175 mm. The size of the weeder shall be declared by the manufacturer. The nominal size shall be the width of the blade or the roller whichever is larger.

G-2.2 The overall dimensions of the weeders shall be 650 mm × 1 500 mm.

G-2.3 The tolerances for various dimensions shall be of coarse class specified in IS 2102 (Part 1).

G-3 CONSTRUCTIONAL REQUIREMENTS

G-3.1 Pegs

The length of the pegs shall be 30 to 40 mm and the pegs shall be welded on the roller. The pegs shall be of 12 mm diameter and tappered to have a tip of 3 mm diameter and the spacing between the pegs shall be 30 to 45 mm.

G-3.1.1 The dimensions for mounting of pegs shall be as given in Fig. 9.

G-4 Axle

G-4.1 The axle shall be not less than 10 mm in diameter.

G-4.1.1 *Washer*

Washers shall be provided on both sides of the rollers

G-4.2 Star Wheels

The overall dimensions of the star wheels shall be as given in Fig. 11 and the dimensions for mounting of star wheels shall be as given in Fig. 10.

G-4.3 Cutting Blade

The nominal width of cutting blade shall be 125 mm, 150 mm or 175 mm. The cutting blade shall be fixed behind the roller through bolts and nuts of size M-8, *Min*.

Table 3 Materials for Different Components of Dry Land Weeder

(*Clause* G - 1)

Sl No.	Name of the Part	Material	Applicable Indian Standard	Grade
(1)	(2)	(3)	(4)	(5)
i)	Roller frame	Mild steel	IS 2062	—
ii)	Handle	Mild steel pipe	IS 3601	—
		Plastic	—	—
		Seasoned wood	—	—
		Bamboo		
iii)	Cutting blade	Carbon steel	IS 1570 (Part 2/Sec 1)	60C6
		Spring steel	—	—
iv)	Pegs/star wheel	Carbon steel	IS 1570 (Part 2/Sec 1)	60C6
v)	Blade arm	Mild steel	2062	—
vi)	Axle	do	2062	—
vii)	Handle grip	Rubber	—	—
		Plastic	—	—
		Wood	IS 620	—
viii)	Washer	Mild steel	IS 2062	—
ix)	Bush	Cast iron	IS 210	—
		Mild steel	IS 2062	—

G-4.4 Roller Frame

The roller frame shall be made of mild steel flat of thickness 3 mm, *Min*.

G-4.5 Handle and Handle Frame

Handle and handle frame shall be made of mild steel pipe of 25 mm and 18 mm inside diameter respectively. Handle shall be provided with suitable grip. The diameter of the grip shall be between 30 mm and 35 mm. The angle between the handle and handle frame shall be 105°.

G-4.5.1 The overall dimensions of length, height and handle width for handles and handle frame made of wood, bamboo or plastics shall be such that they are within the overall dimensions specified in G-4.2. The height of the handle shall be adjustable.

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards : Monthly Additions'.

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Amendments Issued Since Publication

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BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 323 01 31, 323 94 02, 323 33 75

Telegrams: Manaksanstha
(Common to all offices)

Regional Offices:	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	323 76 17 323 38 41
Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola CALCUTTA 700054	337 84 99, 337 85 61 337 86 26, 337 86 62
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43 60 20 25
Southern : C. I. T. Campus, IV Cross Road, CHENNAI 600113	235 02 16, 235 04 42 235 15 19, 235 23 15
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